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(54) TRIANGULAR PRISM SHEET FOR LIQUID CRYSTAL DISPLAY DEVICE AND ITS MANUFACTURE

(57)Abstract:

PURPOSE: To obtain the triangular prism sheet for the liquid crystal display device which enables the easy formation of a fine-pitch prism pattern and can provide a liquid crystal screen having high brightness and superior directivity without greatly improving the luminance of a back lighting means.

CONSTITUTION: This manufacture method consists of a resin coating process wherein a mold where a prism pattern is formed is coated with an active energy ray setting type resin composition, a laminating process wherein a transparent base material which transmits an active energy ray is superposed on the active energy ray setting type resin composition, a setting process wherein the active energy ray setting type resin composition is irradiated with the active energy ray through the transparent base material and cured, and a releasing process wherein the active energy ray setting type resin composition is released from the mold; and the triangular prism sheet for the liquid crystal display device where a series of thin and long triangular-sectioned prisms having a 70-110° vertical angle are successively formed and its manufacture are obtained.

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(54)【発明の名称】 液晶表示装置用三角プリズムシートおよびその製造方法

(57)【要約】

【目的】 ファインピッチのプリズムパターンを容易に形成できるとともに、背面照明手段に格別の明るさ向上を行うことなく、輝度の高い指向性に優れた液晶画面を提供できる液晶表示装置用三角プリズムシートを得る。

【構成】 プリズムパターンが形成された成型型に活性エネルギー線硬化型樹脂組成物を塗布する樹脂塗布工程と、前記活性エネルギー線硬化型樹脂組成物に活性エネルギー線を透過する透明基材を重ね合わせる積層工程と、前記活性エネルギー線硬化型樹脂組成物に前記透明基材を通して活性エネルギー線を照射して硬化させる硬化工程と、前記成型型から前記活性エネルギー線硬化型樹脂組成物を離型する離型工程とからなり、頂角の角度が70°～110°の一連の細長い断面三角形状のプリズムが連続して多数形成されてなる液晶表示装置用三角プリズムシートおよびその製造方法。

【特許請求の範囲】

【請求項1】 活性エネルギー線硬化型樹脂組成物から形成され、その表面に頂角の角度が $70 \sim 110^\circ$ の一連の細長い断面三角形形状のプリズムが連続して多数形成されてなることを特徴とする液晶表示装置用三角プリズムシート。

【請求項2】 透明基材と、該透明基材上に形成され活性エネルギー線硬化型樹脂組成物からなるプリズム部とからなることを特徴とする請求項1記載の液晶表示装置用三角プリズムシート。

【請求項3】 プリズムパターンが形成された成型型に活性エネルギー線硬化型樹脂組成物を塗布する樹脂塗布工程と、前記活性エネルギー線硬化型樹脂組成物に活性エネルギー線を透過する透明基材を重ね合わせる積層工程と、前記活性エネルギー線硬化型樹脂組成物に前記透明基材を通して活性エネルギー線を照射して硬化させる硬化工程と、前記成型型から前記活性エネルギー線硬化型樹脂組成物を離型する離型工程とからなることを特徴とする液晶表示装置用三角プリズムシートの製造方法。

【請求項4】 透明基材を剥離する剥離工程を含むことを特徴とする請求項3記載の液晶表示装置用三角プリズムシートの製造方法。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、液晶テレビ、コンピュータ用ディスプレイ等の液晶ディスプレイ等の液晶表示装置に使用される三角プリズムシートおよびその製造方法に関するものである。

【0002】

【従来の技術】液晶表示装置は、その軽量化や高精細化等に伴って、OA機器やパーソナルコンピュータ等に広く使用されている。しかし、液晶自体は発光しないため、背面照明手段を用いて輝度の向上を図っている。一方、最近では、カラー液晶テレビ等をはじめとして、液晶表示装置のカラー化が進んでおり、さらなる輝度の向上が要求されるようになってきている。このようなカラー液晶表示素子においては、これまでの単色液晶表示装置用の背面照明手段では十分な輝度を確保することができなくなっている。そこで、背面照明手段を改良してその明るさを向上させる試みがなされてきている。

【0003】

【発明が解決しようとする課題】しかし、背面照明手段の明るさを向上させる方法では、発熱量の増大やコストアップ等の新たな問題点を伴っている。そこで、本発明の目的は、背面照明手段の明るさの改良による発熱量の増大等の問題点を伴うことなく、液晶表示装置の画面輝度を向上できる液晶表示装置用三角プリズムシートおよびその製造方法を提供することにある。

【0004】

【課題を解決するための手段】本発明者等は、このよう

な状況に鑑み、特定のプリズム頂角を有するマルチプリズムシートを使用することによって液晶表示装置の輝度を向上できることを見出し、本発明に到達したものである。すなわち、本発明の液晶表示装置用三角プリズムシートは、活性エネルギー線硬化型樹脂組成物から形成され、その表面に頂角の角度が $70 \sim 110^\circ$ の一連の細長い断面三角形形状のプリズムが連続して多数形成されてなることを特徴とするものである。また、本発明の液晶表示装置用三角プリズムシートの製造方法は、プリズムパターンが形成された成型型に活性エネルギー線硬化型樹脂組成物を塗布する樹脂塗布工程と、前記活性エネルギー線硬化型樹脂組成物に活性エネルギー線を透過する透明基材を重ね合わせる積層工程と、前記活性エネルギー線硬化型樹脂組成物に前記透明基材を通して活性エネルギー線を照射して硬化させる硬化工程と、前記成型型から前記活性エネルギー線硬化型樹脂組成物を離型する離型工程とからなることを特徴とするものである。

【0005】本発明の三角プリズムシートについて図1～図3を用いて説明する。図1は、本発明三角プリズムシートを使用した液晶表示装置の実施例を示した部分断面図であり、図中2は液晶表示素子で背面照明手段3の上に設置され、液晶表示素子2の上には三角プリズムシート1が設置されている。図2は、本発明三角プリズムシートを使用した液晶表示装置の別の実施例を示した部分断面図であり、背面照明手段3の上に三角プリズムシート1を設置した例を示すものである。

【0006】三角プリズムシート1は、活性エネルギー線硬化型樹脂組成物から形成されており、板状、シート状あるいはフィルム状の形態で使用される。三角プリズムシート1の一方の表面には、一連の細長い断面三角形形状のプリズムが連続して多数形成されている。三角プリズムシート1の部分断面図を図3に示した。図中8は、合成樹脂からなる透明基材であって、透明基材8の一方の表面にプリズム形状が形成された活性エネルギー線硬化型樹脂組成物からなるプリズム部9が一体に構成されている。なお、本発明の三角プリズムシート1は、図3のように透明基材8とレンズ部の2層構造として使用してもよいが、透明基材8を剥離して使用する構造のものであってもよい。この場合、界面のない均一なシートとなるため、界面での光の反射あるいは界面剥離等の欠陥発生がなく、耐久性および耐候性の観点からは透明基材8を剥離したものが好ましい。

【0007】本発明の三角プリズムシートを形成する活性エネルギー線硬化型樹脂組成物としては、透明性に優れたものであれば特に限定されるものではないが、三角プリズムシートの機械的特性等の点から架橋硬化重合物を与える組成物が好ましい。そのような樹脂組成物としては、例えば、不飽和ポリエステルスチレン系、エポキシ樹脂-ルイス酸系、ポリエン-チオール系、(メタ)アクリル酸エステル系等が挙げられる。中でも、透

明性の高い(メタ)アクリル酸エステル系が特に好ましく、例えば、ポリエステル(メタ)アクリレート、エポキシ(メタ)アクリレート、ポリウレタン(メタ)アクリレート等のプレポリマーと、単官能あるいは多官能の(メタ)アクリレートモノマーとの組合せ等が挙げられる。

【0008】これら樹脂は、単独あるいは組み合わせて使用することができるが、得られるプリズムシートの弾性率等を考慮して選択することが好ましい。特に、活性エネルギー線硬化型樹脂の硬化後の25℃における弾性率が10000~50000kg/cm²の範囲にあるように調整することが好ましい。これは、弾性率が10000kg/cm²未満であると、プリズムシートが柔らかくなりすぎ液晶表示装置に組込む際の取扱性や作業性に劣るとともに、プリズム頂部が液晶表示素子に接触する場合にプリズム頂部に潰れが生じ画面上に影が発生するためである。また、弾性率が50000kg/cm²を超えると、プリズムが硬く脆くなり僅かの衝撃で破損するおそれがあるためである。

【0009】本発明で樹脂組成物の硬化に使用される活性エネルギー線としては、電子線、イオン線等の粒子線、γ線、X線、紫外線、可視光線、赤外線等の電磁波線等が挙げられるが、硬化速度や生産設備等の点から紫外線が好ましい。本発明の液晶表示装置において、輝度の向上のためには、プリズム頂角の角度θを70~110°の範囲に設定することが重要であり、好ましくは75~95°の範囲である。これは、プリズム頂角の角度θが70°未満では、指向性が顕著になり正面以外から見た場合には画面が著しく暗くなるためであり、逆に110°を超えると光の集光性が低下し輝度向上効果が得られなくなったり、プリズムシートの厚さによる光の吸収のために輝度が低下するためである。

【0010】プリズムのピッチaは、100μm以下であることが好ましくさらに、好ましくは70~90μmの範囲である。これは、液晶表示装置のカラー化に伴い、そのカラーフィルターのピッチが小さくなってきており、画面のモアレ模様の発生を防止や画面の精細度を向上の観点から、プリズムのピッチaも小さい方が好ましいためである。また、プリズムの凹凸の高さbは、プリズム頂角の角度θとプリズムのピッチaの値によって決定されるが、好ましくは30~50μmの範囲である。さらに、三角プリズムシート1の厚さcは、強度面からは厚い方が好ましいが、光学的には光の吸収を抑えるため薄い方が好ましい。このため、使用する液晶表示装置の画面の大きさ、使用条件等によって適度な厚さに設定される。例えば、4~10インチ程度の画面の液晶表示装置では数百μm以下程度の厚さであることが好ましく、200~500μmの範囲であれば、強度および光学特性のバランスがとれて好ましい。

【0011】上記のような三角プリズムシート1は、背

面照明手段3の上に設置された液晶表示素子2の上に設置して使用され、プリズム面と液晶表示素子とが相対するように三角プリズムシートを液晶表示素子の上に設置する。このような構成された液晶表示装置では、三角プリズムシートを液晶表示素子の上に設置したことにより、光の拡散を抑制でき、輝度の高い指向性に優れた液晶表示装置が得られるものである。

【0012】なお、液晶表示装置を構成する液晶表示素子2としては、例えば、スペーサーにより一定の間隔を隔てて設けられた2枚のガラス基板の間に液晶が充填されて構成されている。さらに、この2枚の上下ガラス基板のそれぞれの外面には偏光板が設けられており、上部のガラス基板の内面にはカラーフィルター層と、このカラーフィルター層の外面に内部電極が設けられ、下部のガラス基板の内面には内部電極が設けられている。内部電極は、微小な画素電極が多数縦横に配列されて構成されている。また、カラーフィルター層は、赤、緑、青の3色の色フィルターを、画素電極に対応させて配列して、各々の画素を形成している。

【0013】また、背面照明手段3は、光量調整パターン4を形成した出射面と、その反対面に反射膜6を形成した反射面とを有する導光板5と、その一端に蛍光灯等の線状光源7を配置して構成されている。そして、導光板5の一端端面から入射した線状光源7からの入射光が、導光板5を通して、一部は反射膜6に反射して出射面から出射して、液晶表示素子2の裏面側から均一に照射するようになっている。なお、背面照明手段3としては、図1に示した構造のものに限らず、通常使用されている種々の背面照射手段を使用することができる。

【0014】次に、本発明の三角プリズムシートの製造方法について説明する。本発明の三角プリズムシートは、前記活性エネルギー線硬化型樹脂組成物をプリズムパターンが形成された金型あるいは樹脂型等の成型型に塗布し、樹脂組成物の表面を平滑化した後、透明基材を重ね合わせ活性エネルギー線を照射して硬化させることによって製造される。これによって、液晶表示装置のカラー化に伴うカラーフィルターのファイン化にも対応できるファインピッチのプリズムパターンを、光学特性を損なうことなく容易に製造できるものである。

【0015】活性エネルギー線硬化型樹脂組成物の成型型への塗布方法としては、一度の塗布にによって必要な樹脂組成物を成型型に塗布してもよいが、プリズムパターンが形成された成型型のパターン部を均一に埋めるようにプリズム部先端部を形成する樹脂組成物を塗布する第1塗布工程と、さらにその上にプリズム部基部を形成する樹脂組成物を塗布する第2塗布工程の2段階の塗布工程によって塗布してもよい。この場合、第1塗布工程の後に塗布した樹脂組成物塗布層の表面を平滑化することによって、厚さ斑のない均一な三角プリズムシートが得られ好ましい。また、第1の塗布層を平滑化した後

に、活性エネルギー線を照射して樹脂組成物を硬化または半硬化されることによって、第2塗布工程による第1の樹脂組成物塗布層が移動して、両者の間にレンズ型の形状に起因する気泡の発生を抑制できるため好ましい。

【0016】ここで、透明基材としては透明性の高いものであれば、厚さ、材料については特に限定されるものではないが、活性エネルギー線の透過性や取扱性等を考慮した場合には、厚さ3mm以下のものが好ましい。また、材料としては、例えば、アクリル樹脂、ポリカーボネート樹脂、ポリエステル樹脂、ポリスチレン樹脂、フッ素樹脂、ポリイミド樹脂、これらポリマーの混合物等の合成樹脂あるいはガラス等が挙げられる。このような透明基材には、その表面に微細な凹凸を設けたり、微粉末を塗布する等の反射防止処理を施してもよい。反射防止処理は、透明基材を剥離して使用する場合でも、活性エネルギー線硬化型樹脂組成物を形成する表面に形成することによって、剥離後のプリズム部表面に反射防止面が付与されることになるので好ましい。

【0017】本発明において、活性エネルギー線硬化型樹脂組成物を硬化させるために使用する活性エネルギー線としては、電子線、イオン線等の粒子線、 γ 線、X線、紫外線、可視光線、赤外線等の電磁波線等が挙げられるが、硬化速度や生産設備等の点から紫外線が好ましい。

【0018】このようにして製造された透明基材上に活性エネルギー線で硬化された樹脂組成物からなるプリズム部を形成してなる三角プリズムシートは、そのまま使*

ファンクリルFA-321M
(日立化成社製エチレンオキシド変性
ビスフェノールAメタクリレート)
NKエステルA-BPE-4
(新中村化学社製エチレンオキシド変
性ビスフェノールAジアクリレート)
サートマー285
(サートマー社製テトラヒドロフル
リルアクリレート)
ダロキューア1173
(メルクジャパン社製2-ヒドロキシ
-2-メチル-1-フェニルプロパ
ン-1-オン)

表面輝度 $7000\text{cd}/\text{m}^2$ を有する背面照射手段を用いた液晶表示装置を用いて、得られた三角プリズムシートを背面照射手段の上にプリズム面が液晶表示素子に相対するように設置して表面輝度を測定し、その時の指向性を目視によって次の評価基準に従って評価した。

【0021】○：指向性が少なく、角度による明るさの変化が少ないもの

×：指向性が顕著であり、正面以外から見た場合に暗くなるもの

*用することもできるが、透明基材を剥離してプリズム部単独の状態として使用してもよい。透明基材上にプリズム部を形成したまま使用する場合には、その界面の接着が十分であることが耐候性および耐久性の点で重要であり、透明基材にプライマー処理等の接着性向上処理を施すことが好ましい。一方、透明基材を剥離して使用する場合には、比較的容易に剥離性できるようにすることが好ましく、透明基材の表面をシリコンやフッ素系の剥離剤で表面処理を施すことが好ましい。ただし、この場合も成型型からシートを離型するまでは透明基材とプリズム部が密着している必要があるため、接着性と剥離性のバランスを適宜調整することが必要となる。

【0019】

【実施例】以下、実施例によって本発明を具体的に説明する。

実施例1～3、比較例1～2

成形後のプリズムのピッチおよびプリズム頂角が、それぞれ表1に示した通りとなるように予め設計された金型に、紫外線硬化型樹脂組成物として以下の混合物を塗布し、その表面を平滑化した後、厚さ $500\mu\text{m}$ のポリカーボネートフィルムを重ね合わせた。次いで、 $320\sim 390\text{nm}$ の積算紫外線照射量で $1000\text{mJ}/\text{cm}^2$ の紫外線を照射して、紫外線硬化型樹脂組成物を硬化させた。その後、金型から剥離して三角プリズムシートを得た。いずれの三角プリズムシートも設計通りの形状を有していた。

【0020】

45重量部

25重量部

30重量部

3重量部

また、上記樹脂組成物を用いて、ガラスセルキャスト法で2mmの厚さの樹脂板を作成し、得られた樹脂板を幅10mm、長さ60mmに切断し、32mmの間隔に設置した2点で支え3点曲げ試験を行った。これらの結果を表1に示した。なお、三角プリズムシートを使用しない場合の表面輝度は、 $200\text{cd}/\text{m}^2$ であった。

【0022】実施例4

実施例1と同一の金型に $200\mu\text{m}$ のスペーサーを設置し、実施例1と同一の紫外線硬化型樹脂組成物を金型に

塗布し、その表面を平滑化した後、メタクリル酸メチル 80重量部とスチレン20重量部とを重合して得られた厚さ3mmの樹脂板を重ね合わせた。次いで、320～390nmの積算紫外線照射量で1000mJ/cm²の紫外線を照射して、紫外線硬化型樹脂組成物を硬化させた。その後、基材とともに金型から剥離し、さらに基材として使用した樹脂板を剥離して三角プリズムシートを得た。得られた三角プリズムシートは設計通りの形状を有していた。得られた三角プリズムシートを用いて実施例1と同じ方法で、表面輝度を測定した。また、実施例1と同じ方法で3点曲げ試験を行った。これらの結果*

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比較例3

実施例1と同一の金型に、ポリメチルマタクリレートに10重量%含有したメチルメタクリレートモノマーに、開始剤として和光純薬社製AIBNを1重量%添加した樹脂組成物を塗布した後、厚さmmのガラス板を重ね合わせた。次いで、60℃の温水中で樹脂組成物を硬化させた後、金型から剥離して三角プリズムシートを得た。得られた三角プリズムシートは設計通りの形状を有していたが、樹脂組成物が完全に硬化するまでに約5時間(30)も要した。また、硬化温度を高くしたり、開始剤の添加量を増やしたりして硬化時間の短縮を試みたが、いず※

*を表1に示した。

【0023】実施例5

紫外線硬化型樹脂組成物として以下の混合物を使用した以外は実施例1と同様の方法で三角プリズムシートを得た。得られた三角プリズムシートは設計通りの形状を有していた。得られた三角プリズムシートを用いて実施例1と同じ方法で、表面輝度を測定した。また、実施例1と同じ方法で3点曲げ試験を行った。これらの結果を表1に示した。

【0024】

85重量部

15重量部

3重量部

※れも硬化異常が発生して良好な形状の三角プリズムシートは得られなかった。

【0025】比較例4

成形後の三角プリズムシートが、ピッチ50μm、プリズム頂角90°となるように設計したダイを使用し、ポリカーボネート樹脂を用いて常法に従って押出成形によって三角プリズムシートを得た。得られた三角プリズムシートはプリズム頂上が潰れており、良好な三角プリズムシートは得られなかった。

【0026】

【表1】

	プリズムピッチ (μm)	プリズム頂角 (°)	液晶画面輝度 (cd/m ²)	曲げ弾性率 (kg/mm ²)	指向性
実施例1	50	90	290	25000	○
実施例2	50	75	300	25000	○
実施例3	50	100	220	25000	○
実施例4	50	90	300	25000	○
実施例5	50	90	295	29000	○
比較例1	50	60	285	25000	×
比較例2	50	120	196	25000	○

【0027】

【発明の効果】本発明の三角プリズムシートは、特定の範囲のプリズム頂角の角度を有し、少なくともプリズム

部を活性エネルギー線硬化型樹脂組成物によって構成することによって、ファインピッチのプリズムパターンを容易に形成できるとともに、液晶画面の光の拡散を抑制

9

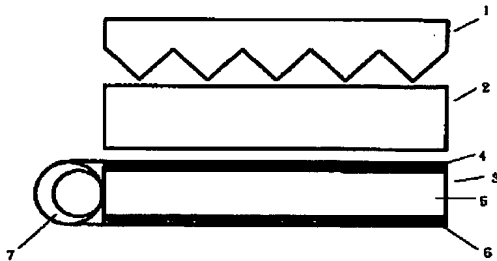
して、輝度の高い指向性に優れた液晶表示装置を提供でき、背面照明手段に格別の明るさ向上を行うことなく、カラー液晶表示装置でも十分な輝度が得られるものである。

【図面の簡単な説明】

【図1】本発明の三角プリズムシートの使用例を示した液晶表示装置の概略断面図である。

【図2】本発明の三角プリズムシートその他の使用例を示した液晶表示装置の概略断面図である。

【図1】



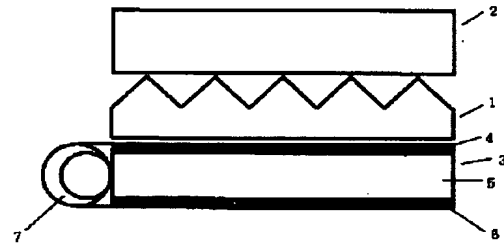
10

【図3】本発明の三角プリズムシートの一部を示す断面図である。

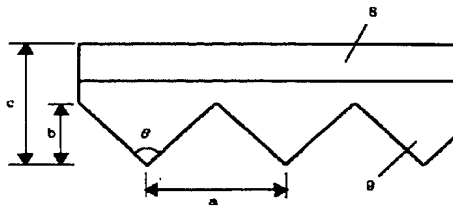
【符号の説明】

- 1 三角プリズムシート
- 2 液晶表示素子
- 3 背面照明手段
- 8 透明基材
- 9 プリズム部

【図2】



【図3】



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(54) TRIANGULAR PRISM SHEET FOR LIQUID CRYSTAL DISPLAY DEVICE AND ITS MANUFACTURE

(57)Abstract:

PURPOSE: To obtain the triangular prism sheet for the liquid crystal display device which enables the easy formation of a fine-pitch prism pattern and can provide a liquid crystal screen having high brightness and superior directivity without greatly improving the luminance of a back lighting means.

CONSTITUTION: This manufacture method consists of a resin coating process wherein a mold where a prism pattern is formed is coated with an active energy ray setting type resin composition, a laminating process wherein a transparent base material which transmits an active energy ray is superposed on the active energy ray setting type resin composition, a setting process wherein the active energy ray setting type resin composition is irradiated with the active energy ray through the transparent base material and cured, and a releasing process wherein the active energy ray setting type resin composition is released from the mold; and the triangular prism sheet for the liquid crystal display device where a series of thin and long triangular-sectioned prisms having a 70-110° vertical angle are successively formed and its manufacture are obtained.

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3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] The triangular prism sheet for liquid crystal displays with which it is formed from an activity energy-line hardening type resin constituent, and the prism of a series of long and slender shape of a cross-section triangle whose angles of a vertical angle are 70-110 degrees is continuously characterized by many formation, now bird clappers on the front face.

[Claim 2] The triangular prism sheet for liquid crystal displays according to claim 1 characterized by the bird clapper from a transparent base material and the prism section which is formed on this transparent base material and consists of an activity energy-line hardening type resin constituent.

[Claim 3] The manufacture method of the triangular prism sheet for liquid crystal displays characterized by providing the following. The resin application process which applies an activity energy-line hardening type resin constituent to the form block with which the prism pattern was formed. The laminating process which lays the transparent base material which penetrates an activity energy line on top of the aforementioned activity energy-line hardening type resin constituent. The hardening process which the aforementioned activity energy-line hardening type resin constituent is irradiated [process], and makes it harden an activity energy line through the aforementioned transparent base material. The mold release process which releases the aforementioned activity energy-line hardening type resin constituent from mold from the aforementioned form block.

[Claim 4] The manufacture method of the triangular prism sheet for liquid crystal displays according to claim 3 characterized by including the exfoliation process which exfoliates a transparent base material.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to the triangular prism sheet used for liquid crystal displays, such as liquid crystal displays, such as a display for a liquid crystal television and computers, and its manufacture method.

[0002]

[Description of the Prior Art] The liquid crystal display is widely used for OA equipment, the personal computer, etc. with the lightweight-izing, highly-minute-izing, etc. However, since the liquid crystal itself does not emit light, it is aiming at improvement in brightness using the backlighting means. It is ***** so that colorization including liquid crystal displays, such as electrochromatic display television, may progress and recently may, on the other hand, require improvement in the further brightness. It is becoming impossible to secure brightness sufficient with the backlighting means for old monochrome liquid crystal displays in such an electrochromatic display device. Then, the attempt which improves a backlighting means and raises the luminosity has been made.

[0003]

[Problem(s) to be Solved by the Invention] However, by the method of raising the luminosity of a backlighting means, it is accompanied by new troubles, such as increase of calorific value, and a cost rise. Then, the purpose of this invention is to offer the triangular prism sheet for liquid crystal displays which can improve the screen intensity of a liquid crystal display with troubles, such as increase of the calorific value by improvement of the luminosity of a backlighting means, and its manufacture method.

[0004]

[Means for Solving the Problem] By using the multi-prism sheet which has a specific prism vertical angle in view of such a situation, this invention person etc. finds out that the brightness of a liquid crystal display can be improved, and reaches this invention. That is, the triangular prism sheet for liquid crystal displays of this invention is formed from an activity energy-line hardening type resin constituent, and the prism of a series of long and slender shape of a cross-section triangle whose angles of a vertical angle are 70-110 degrees is continuously characterized by many formation, now bird clappers on the front face. Moreover, the manufacture method of the triangular prism sheet for liquid crystal displays of this invention The resin application process which applies an activity energy-line hardening type resin constituent to the form block with which the prism pattern was formed, The laminating process which lays the transparent base material which penetrates an activity energy line on top of the aforementioned activity energy-line hardening type resin constituent, It is characterized by the bird clapper from the hardening process which the aforementioned activity energy-line hardening type resin constituent is irradiated [process], and makes it harden an activity energy line through the aforementioned transparent base material, and the mold release process which releases the aforementioned activity energy-line hardening type resin constituent from mold from the aforementioned form block.

[0005] The triangular prism sheet of this invention is explained using drawing 1 - drawing 3 . Drawing 1 is the fragmentary sectional view having shown the example of the liquid crystal display which used this invention triangular prism sheet, two in drawing is installed on the backlighting means 3 with a liquid crystal display element, and the triangular prism sheet 1 is installed on the liquid crystal display element 2. Drawing 2 is the fragmentary sectional view having shown another example of the liquid crystal display which used this invention triangular prism sheet, and shows the example which installed the triangular prism sheet 1 on the backlighting means 3.

[0006] The triangular prism sheet 1 is formed from the activity energy-line hardening type resin constituent, and is used with the gestalt of the shape of a tabular, the shape of a sheet, and a film. Many prism of a series of shape of a long and slender cross-section triangle is continuously formed in one front face of the triangular prism sheet 1. The

fragmentary sectional view of the triangular prism sheet 1 was shown in drawing 3 . Eight in drawing is a transparent base material which consists of synthetic resin, and the prism section 9 which consists of an activity energy-line hardening type resin constituent with which the shape of a triqueter was formed in one front face of the transparent base material 8 is constituted by one. In addition, although the triangular prism sheet 1 of this invention may be used as two-layer structure of the transparent base material 8 and the lens section like drawing 3 , it may be the thing of the structure which uses the transparent base material 8, exfoliating. In this case, since it becomes a uniform sheet without an interface, what there is no defective generating of reflection of the light in an interface or interfacial peeling, and exfoliated the transparent base material 8 from a viewpoint of endurance and weatherability is desirable.

[0007] Although it is not limited as an activity energy-line hardening type resin constituent which forms the triangular prism sheet of this invention especially if excelled in transparency, the constituent which gives a bridge formation hardening polymerization object from points, such as the mechanical property of a triangular prism sheet, is desirable. As such a resin constituent, a unsaturated-polyester-styrene system, an epoxy resin-Lewis-acid system, a polyene-thiol system, an acrylic-ester (meta) system, etc. are mentioned, for example. Especially, especially the high (meta) acrylic-ester system of transparency is desirable, for example, the combination of prepolymers, such as polyester (meta) acrylate, epoxy (meta) acrylate, and polyurethane (meta) acrylate, and the acrylate (meta) monomer of single organic functions or many organic functions etc. is mentioned.

[0008] Although it can be combined and used, as for these resins, it is desirable independent or to choose in consideration of the elastic modulus of the prism sheet obtained etc. The elastic modulus especially in 25 degrees C after hardening of an activity energy-line hardening type resin is 10000 - 50000 kg/cm². Adjusting, as it is in the range is desirable. For this, elastics modulus are 10000 kg/cm². While it is inferior to the handling nature and the workability at the time of a prism sheet becoming it soft that it is the following too much, and including in a liquid crystal display, when a prism crowning contacts a liquid crystal display element, it is for crushing to arise in the prism crowning and for a shadow to occur on a screen. Moreover, elastics modulus are 50000 kg/cm². When it exceeds, it is because there is a possibility of prism becoming weak firmly and damaging with few shocks.

[0009] As an activity energy line used for hardening of a resin constituent by this invention, although electromagnetic wave lines, such as corpuscular rays, such as an electron ray and an ionic line, a gamma ray, an X-ray, ultraviolet rays, a visible ray, and infrared radiation, etc. are mentioned, the point of a cure rate, a production facility, etc. to ultraviolet rays are desirable. In the liquid crystal display of this invention, for improvement in brightness, it is important to set the angle theta of a prism vertical angle as the range of 70-110 degrees, and it is the range of 75-95 degrees preferably. Since a screen becomes remarkably dark when directivity becomes remarkable and the angle theta of a prism vertical angle sees from other than a transverse plane at less than 70 degrees, when this is obtained, and there is and it exceeds 110 degrees conversely, it is for the condensing nature of light to fall and for brightness to fall for the absorption of light according to the thickness of a prism sheet in that the improvement effect in brightness is no longer acquired

****.

[0010] It is desirable still more desirable that it is 100 micrometers or less, and the range of the pitch a of prism is 70-90 micrometers. The pitch of the light filter is becoming small with colorization of a liquid crystal display, and the pitch a of this of the viewpoint of the prevention and the improvement by the definition of a screen by generating of the moire pattern of a screen to prism is because the smaller one is desirable. Moreover, although height b of the irregularity of prism is determined by the angle theta of a prism vertical angle, and the value of the pitch a of prism, the range of it is 30-50 micrometers preferably. Furthermore, although thickness c of the triangular prism sheet 1 has the thicker desirable one from an on-the-strength side, the thinner one is desirable in order to stop the absorption of light optically. For this reason, it is set as moderate thickness according to the size of the screen of the liquid crystal display to be used, a service condition, etc. For example, it is desirable that it is the thickness of about hundreds of micrometers or less in the liquid crystal display of an about 4-10 inches screen, and if it is the range which is 200-500 micrometers, intensity and an optical property can be balanced and it is desirable.

[0011] The above triangular prism sheets 1 are used installing on the liquid crystal display element 2 installed on the backlighting means 3, and a triangular prism sheet is installed on a liquid crystal display element so that a prism side and a liquid crystal display element may face. such -- what -- in the constituted liquid crystal display, by having installed the triangular prism sheet on the liquid crystal display element, diffusion of light can be suppressed and the liquid crystal display excellent in directivity with high brightness is obtained

[0012] In addition, as a liquid crystal display element 2 which constitutes a liquid crystal display, liquid crystal is filled up with and constituted between two glass substrates prepared by separating a fixed interval with a spacer, for example. Furthermore, the polarizing plate is prepared in each superficies of these two vertical glass substrates, an internal electrode is prepared in the inside of a upside glass substrate at the superficies of a light-filter layer and this

light-filter layer, and the internal electrode is prepared in the inside of a lower glass substrate. Many minute pixel electrodes are arranged in all directions, and the internal electrode is constituted. Moreover, a light-filter layer makes a pixel electrode correspond, arranges the color filter of three colors of red, green, and blue, and forms each pixel.

[0013] moreover, the light guide plate 5 which has the outgoing radiation side in which the backlighting means 3 formed the quantity of light adjustment pattern 4, and the reflector in which the reflective film 6 was formed to the opposite side and its end -- lines, such as a fluorescent lamp, -- the light source 7 is arranged and it is constituted and the line which carried out incidence from the unilateral end face of a light guide plate 5 -- the incident light from the light source 7 lets a light guide plate 5 pass, it reflects in the reflective film 6, and outgoing radiation of the part is carried out from an outgoing radiation side, and it irradiates homogeneity from the rear-face side of the liquid crystal display element 2 In addition, as a backlighting means 3, not only the thing of the structure shown in drawing 1 but the various tooth-back irradiation meanses usually used can be used.

[0014] Next, the manufacture method of the triangular prism sheet of this invention is explained. After applying the aforementioned activity energy-line hardening type resin constituent to form blocks, such as metal mold with which the prism pattern was formed, or a plastic pattern, and smoothing the front face of a resin constituent, the triangular prism sheet of this invention piles up a transparent base material, and is manufactured by irradiating an activity energy line and stiffening it. The prism pattern of a fine pitch which can respond also to fine ** of the light filter accompanying colorization of a liquid crystal display by this can be manufactured easily, without spoiling an optical property.

[0015] As the method of application to the form block of an activity energy-line hardening type resin constituent The 1st application process which applies the resin constituent which forms a prism section point so that the pattern section of the form block with which the prism pattern was formed may be buried uniformly, although an application may be resembled once and a required resin constituent may therefore be applied to a form block, You may apply according to two steps of application processes of the 2nd application process which applies the resin constituent which furthermore forms a prism section base on it. In this case, by smoothing the front face of the resin constituent application layer applied after the 1st application process, a uniform triangular prism sheet without thickness variation is obtained, and it is desirable. Moreover, since generating of the foam which an activity energy line is irradiated, and the 1st resin constituent application layer by the 2nd application process moves a resin constituent layer hardening or by carrying out semi-hardening, and originates in a lens type configuration among both can be suppressed after smoothing the 1st application layer, it is desirable.

[0016] Here, if transparency is high as a transparent base material, although it is not limited about thickness and especially material, when the permeability of an activity energy line, handling nature, etc. are taken into consideration, a thing with a thickness of 3mm or less is desirable. Moreover, as a material, synthetic resin or glass of acrylic resin, polycarbonate resin, polyester resin, polystyrene resin, a fluororesin, polyimide resin, and these polymer, such as mixture, etc. is mentioned, for example. Detailed irregularity may be prepared in the front face, or acid-resisting processing of applying an impalpable powder may be performed to such a transparent base material. Since an acid-resisting side will be given to the prism section front face after exfoliation by forming in the front face which forms an activity energy-line hardening type resin constituent layer even when using a transparent base material, exfoliating, acid-resisting processing is desirable.

[0017] In this invention, as an activity energy line used in order to stiffen an activity energy-line hardening type resin constituent, although electromagnetic wave lines, such as corpuscular rays, such as an electron ray and an ionic line, a gamma ray, an X-ray, ultraviolet rays, a visible ray, and infrared radiation, etc. are mentioned, the point of a cure rate, a production facility, etc. to ultraviolet rays are desirable.

[0018] Thus, although the triangular prism sheet which comes to form the prism section which consists of a resin constituent hardened by the activity energy line on the manufactured transparent base material can also be used as it is, it exfoliates and a transparent base material may be used for it as a prism section independent state. When using it, forming the prism section on a transparent base material, adhesion of the interface comes out enough, a certain thing is important in respect of weatherability and endurance, and it is desirable to perform adhesive improvement processing of priming etc. to a transparent base material. On the other hand, when using a transparent base material, exfoliating, it is desirable that it can be made to carry out detachability comparatively easily, and it is desirable to perform surface treatment for the front face of a transparent base material by the remover of silicone or a fluorine system. However, since a transparent base material and the prism section need to stick until it releases a sheet from mold from a form block also in this case, it is necessary to adjust the balance of adhesive and detachability suitably.

[0019]

[Example] Hereafter, an example explains this invention concretely.

After the pitch and prism vertical angle of prism after examples 1-3, the example 1 of comparison - 2 fabrication

applied the following mixture to the metal mold designed beforehand as an ultraviolet-rays hardening type resin constituent so that it might become and smoothed the front face as they showed in Table 1, respectively, the polycarbonate film with a thickness of 500 micrometers was piled up. Subsequently, they are 1000 mJ/cm² in the amount of addition UV irradiation of 320-390nm. Ultraviolet rays were irradiated and the ultraviolet-rays hardening type resin constituent was stiffened. Then, it exfoliated from metal mold and the triangular prism sheet was obtained. Any triangular prism sheet had the configuration as a design.

[0020]

Fan krill FA-321M 45 weight sections (ethylene oxide denaturation [by Hitachi Chemical Co., Ltd.] bisphenol A methacrylate)

NK ester A-BPE -4 25 weight sections (ethylene oxide [by the new Nakamura chemistry company] strange nature bisphenol A diacrylate)

Sartomer 285 30 weight sections (Sartomer tetrahydro FURUFU RIRUA chestnut rate)

DAROKYUA 1173 3 weight sections (Merck Japan 2-hydroxy -2- methyl-1-phenyl proper N-1-ON)

cd [of surface brightness// 7000], and m² Using the liquid crystal display using the tooth-back irradiation means which it has, the obtained triangular prism sheet was installed so that a prism side might face a liquid crystal display element on a tooth-back irradiation means, surface brightness was measured, and viewing estimated the directivity at that time in accordance with the following error criterion.

[0021] O : thing x:directivity with little [there is little directivity and] change of the luminosity by the angle was remarkable, when it saw from other than a transverse plane, using the thing which becomes dark, and the above-mentioned resin constituent, the resin board with a thickness of 2mm was created by the glass-cell cast method, the obtained resin board is cut in width of face of 10mm, and length of 60mm, and the three-point bending test was performed [it supported by two points installed in the interval of These results were shown in Table 1. In addition, the surface brightness when not using a triangular prism sheet was 200 cd/m².

[0022] After having installed the 200-micrometer spacer in the same metal mold as example 4 example 1, applying the same ultraviolet-rays hardening type resin constituent as an example 1 to metal mold and smoothing the front face, the resin board with a thickness of 3mm obtained by carrying out the polymerization of the methyl-methacrylate 80 weight section and the styrene 20 weight section was piled up. Subsequently, they are 1000 mJ/cm² in the amount of addition UV irradiation of 320-390nm. Ultraviolet rays were irradiated and the ultraviolet-rays hardening type resin constituent was stiffened. Then, it exfoliated from metal mold with the base material, the resin board further used as a base material was exfoliated, and the triangular prism sheet was obtained. The obtained triangular prism sheet had the configuration as a design. By the same method as an example 1, surface brightness was measured using the obtained triangular prism sheet. Moreover, the three-point bending test was performed by the same method as an example 1. These results were shown in Table 1.

[0023] The triangular prism sheet was obtained by the same method as an example 1 except having used the following mixture as an example 5 ultraviolet-rays hardening type resin constituent. The obtained triangular prism sheet had the configuration as a design. By the same method as an example 1, surface brightness was measured using the obtained triangular prism sheet. Moreover, the three-point bending test was performed by the same method as an example 1. These results were shown in Table 1.

[0024]

NK ester A-BPE -4 85 weight sections (ethylene oxide [by the new Nakamura chemistry company] strange nature bisphenol A diacrylate)

Light ester BO 15 weight sections (n[by the Kyoeisha fatty chemistry industrial company]-BUTOKI SHIECHIRU methacrylate)

DAROKYUA 1173 3 weight sections (Merck Japan 2-hydroxy -2- methyl-1-phenyl proper N-1-ON)

Thickness after applying the resin constituent which added Wako Pure Chem azobisisobutironitoriru 1% of the weight as an initiator to the methyl methacrylate monomer which contained the poly methyl MATAKURI rate 10% of the weight in the same metal mold as example of comparison 3 example 1 The glass plate of mm was piled up.

Subsequently, after stiffening a resin constituent in 60-degree C warm water, it exfoliated from metal mold and the triangular prism sheet was obtained. Although the obtained triangular prism sheet had the configuration as a design, by the time the resin constituent hardened completely, it required almost as long as 5 hours. Moreover, although the curing temperature was made high, or the addition of an initiator was increased and shortening of the setting time was tried, the abnormalities in hardening generated all and the triangular prism sheet of a good configuration was not obtained.

[0025] The die designed so that the triangular prism sheet after example of comparison 4 fabrication might serve as pitch 50micrometer and 90 degrees of prism vertical angles was used, and the triangular prism sheet was obtained by

extrusion molding according to the conventional method using polycarbonate resin. As for the obtained triangular prism sheet, the prism summit is destroyed, and the good triangular prism sheet was not obtained.

[0026]

[Table 1]

	プリズムピッチ (μm)	プリズム頂角 ($^{\circ}$)	液晶画面輝度 (cd/m^2)	曲げ弾性率 (kg/mm^2)	指向性
実施例 1	50	90	290	25000	○
実施例 2	50	75	300	25000	○
実施例 3	50	100	220	25000	○
実施例 4	50	90	300	25000	○
実施例 5	50	90	295	29000	○
比較例 1	50	60	285	25000	×
比較例 2	50	120	196	25000	○

[0027]

[Effect of the Invention] Brightness sufficient also with electrochromatic display display be obtain without suppress diffusion of the light of a liquid crystal screen , being able to offer the liquid crystal display excellent in directivity with high brightness , and carry out exceptional improvement in a luminosity to a backlighting means , while the triangular prism sheet of this invention can form the prism pattern of a fine pitch easily by have the angle of the prism vertical angle of the specific range , and constitute the prism section with an activity energy line hardening type resin constituent at least .

[Translation done.]

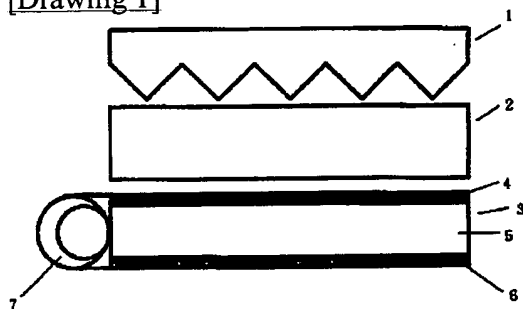
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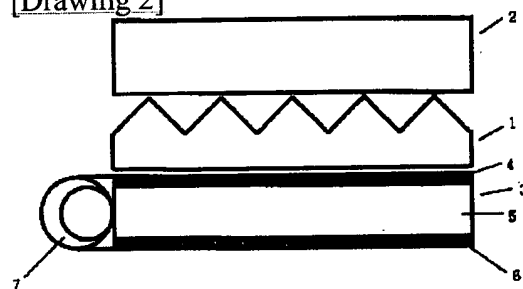
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DRAWINGS

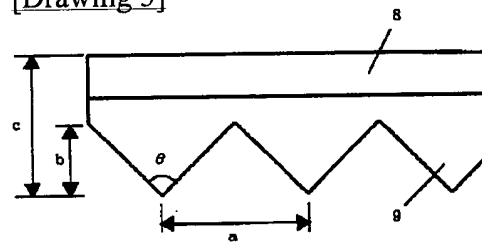
[Drawing 1]



[Drawing 2]



[Drawing 3]



[Translation done.]

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CORRECTION or AMENDMENT

[Official Gazette Type] Printing of amendment by the convention of 2 of Article 17 of patent law.

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G02B	5/02	C 9219-2H.
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G02F	1/1335	530 7724-2K.

[Procedure revision]

[Filing Date] May 16, Heisei 8.

[Procedure amendment 1]

[Document to be Amended] Specification.

[Item(s) to be Amended] The name of invention.

[Method of Amendment] Change.

[Proposed Amendment]

[Title of the Invention] The triangular prism sheet for liquid crystal displays, its manufacture method, and a liquid crystal display.

[Procedure amendment 2]

[Document to be Amended] Specification.

[Item(s) to be Amended] Claim.

[Method of Amendment] Change.

[Proposed Amendment]

[Claim(s)]

[Claim 1] The triangular prism sheet for liquid crystal displays which it is formed from an activity energy-line hardening type resin constituent, and many prism of the shape of a cross-section triangle of a series whose pitch is 100 micrometers or less at 70-110 degrees with a long and slender vertical angle is continuously formed in the front face, and is characterized by the bird clapper.

[Claim 2] The triangular prism sheet for liquid crystal displays according to claim 1 characterized by the bird clapper from a transparent base material and the prism section which is formed on this transparent base material and consists of an activity energy-line hardening type resin constituent.

[Claim 3] The manufacture method of the triangular prism sheet for liquid crystal displays characterized by providing

the following. The resin application process that a vertical angle applies an activity energy-line hardening type resin constituent to the form block with which the prism pattern with which many prism of a series of long and slender shape of a cross-section triangle whose pitches are 100 micrometers or less was continuously formed at 70-110 degrees was formed. The laminating process which lays the transparent base material which penetrates an activity energy line on top of the aforementioned activity energy-line hardening type resin constituent. The hardening process which the aforementioned activity energy-line hardening type resin constituent is irradiated [process], and makes it harden an activity energy line through the aforementioned transparent base material. The mold release process which releases the aforementioned activity energy-line hardening type resin constituent from mold from the aforementioned form block.

[Claim 4] The manufacture method of the triangular prism sheet for liquid crystal displays according to claim 3 characterized by including the exfoliation process which exfoliates a transparent base material.

[Claim 5] The transparent material which has the optical outgoing radiation side which carries out an abbreviation rectangular cross with at least one optical plane of incidence and this which counter the light source and this light source, It is formed from the activity energy-line hardening type resin constituent arranged at the optical outgoing radiation side side of this transparent material. a vertical angle on the front face at 70-110 degrees The liquid crystal display characterized by consisting of liquid crystal display elements by which many prism of a series of long and slender shape of a cross-section triangle whose pitches are 100 micrometers or less has been arranged continuously at the upper part of formation now the becoming triangular prism sheet, and this triangular prism sheet.

[Procedure amendment 3]

[Document to be Amended] Specification.

[Item(s) to be Amended] 0001.

[Method of Amendment] Change.

[Proposed Amendment]

[0001]

[Industrial Application] this invention relates to the liquid crystal display which used the triangular prism sheet used for liquid crystal displays, such as liquid crystal displays, such as a display for a liquid crystal television and computers, its manufacture method, and the triangular prism sheet.

[Procedure amendment 4]

[Document to be Amended] Specification.

[Item(s) to be Amended] 0004.

[Method of Amendment] Change.

[Proposed Amendment]

[0004]

[Means for Solving the Problem] In view of such a situation, this invention person etc. has a specific configuration, finds out that the brightness of a liquid crystal display can be improved by using the multi-prism sheet which consisted of specific material, and reaches this invention. That is, the triangular prism sheet for liquid crystal displays of this invention is formed from an activity energy-line hardening type resin constituent, on the front face, a vertical angle is 70-110 degrees, and the prism of a series of long and slender shape of a cross-section triangle whose pitches are 100 micrometers or less is continuously characterized by many formation, now bird clappers. Moreover, the manufacture method of the triangular prism sheet for liquid crystal displays of this invention is constituted by the following. The resin application process that a vertical angle applies an activity energy-line hardening type resin constituent to the form block with which the prism pattern with which many prism of a series of long and slender shape of a cross-section triangle whose pitches are 100 micrometers or less was continuously formed at 70-110 degrees was formed. The laminating process which lays the transparent base material which penetrates an activity energy line on top of the aforementioned activity energy-line hardening type resin constituent. The hardening process which the aforementioned activity energy-line hardening type resin constituent is irradiated [process], and makes it harden an activity energy line through the aforementioned transparent base material. The mold release process which releases the aforementioned activity energy-line hardening type resin constituent from mold from the aforementioned form block. Furthermore, the transparent material which has the optical outgoing radiation side which carries out an abbreviation rectangular cross with at least one optical plane of incidence and this to which the liquid crystal display of this invention counters the light source and this light source, It is formed from the activity energy-line hardening type resin constituent arranged at the optical outgoing radiation side side of this transparent material. a vertical angle on the front face at 70-110 degrees It is characterized by consisting of liquid crystal display elements by which many prism of a series of long and slender shape of a cross-section triangle whose pitches are 100 micrometers or less has been arranged continuously at the upper part of formation now the becoming triangular prism sheet, and this triangular prism sheet.

[Procedure amendment 5]

[Document to be Amended] Specification.

[Item(s) to be Amended] 0010.

[Method of Amendment] Change.

[Proposed Amendment]

[0010] It is desirable still more desirable that it is 100 micrometers or less, and the range of the pitch a of prism is 90 micrometers or less. The pitch of the light filter is becoming small with colorization of a liquid crystal display, and the pitch a of this of the viewpoint of the prevention and the improvement by the definition of a screen by generating of the moire pattern of a screen to prism is because the smaller one is desirable. Moreover, although height b of the irregularity of prism is determined by the angle θ of a prism vertical angle, and the value of the pitch a of prism, the range of it is 30-50 micrometers preferably. Furthermore, although thickness c of the triangular prism sheet 1 has the thicker desirable one from an on-the-strength side, the thinner one is desirable in order to stop the absorption of light optically. For this reason, it is set as moderate thickness according to the size of the screen of the liquid crystal display to be used, a service condition, etc. For example, it is desirable that it is the thickness of about hundreds of micrometers or less in the liquid crystal display of an about 4-10 inches screen, and if it is the range which is 200-500 micrometers, intensity and an optical property can be balanced and it is desirable.

[Procedure amendment 6]

[Document to be Amended] Specification.

[Item(s) to be Amended] 0011.

[Method of Amendment] Change.

[Proposed Amendment]

[0011] As the above triangular prism sheets 1 were shown in drawing 1, on the liquid crystal display element 2 installed on the backlighting means 3 As a triangular prism sheet may be installed on the liquid crystal display element 2 so that a prism side and the liquid crystal display element 2 may face, and shown in drawing 2 The triangular prism sheet 1 may be installed so that a prism side may serve as facing up on the optical outgoing radiation side of the backlighting means 3, and you may install on the liquid crystal display element 2 further at the upper part. such -- what -- in the constituted liquid crystal display, by having installed the triangular prism sheet on the liquid crystal display element, diffusion of light can be suppressed and the liquid crystal display excellent in directivity with high brightness is obtained

[Procedure amendment 7]

[Document to be Amended] Specification.

[Item(s) to be Amended] 0012.

[Method of Amendment] Change.

[Proposed Amendment]

[0012] The above triangular prism sheets 1 are used for the liquid crystal display of this invention, it possesses this triangular prism sheet 1, the backlighting means 3, and the liquid crystal display element 2 as a basic composition member, and has structure like drawing 2. As a liquid crystal display element 2 which constitutes the liquid crystal display of this invention, liquid crystal is filled up with and constituted between two glass substrates prepared by separating a fixed interval with a spacer, for example. Furthermore, the polarizing plate is prepared in each external surface of these two vertical glass substrates, an internal electrode is prepared in the inside of a upside glass substrate at the external surface of a light-filter layer and this light-filter layer, and the internal electrode is prepared in the inside of a lower glass substrate. Many minute pixel electrodes are arranged in all directions, and the internal electrode is constituted. Moreover, a light-filter layer makes a pixel electrode correspond, arranges the color filter of three colors of red, green, and blue, and forms each pixel.

[Procedure amendment 8]

[Document to be Amended] Specification.

[Item(s) to be Amended] 0013.

[Method of Amendment] Change.

[Proposed Amendment]

[0013] moreover, lines, such as the transparent material 5 of a tabular, a fluorescent lamp, etc. with which the backlighting means 3 has the plane of incidence and the outgoing radiation side of light as shown in drawing 2, -- it comes to provide the light source 7 A transparent material 5 makes an unilateral end face optical plane of incidence, it consists of this optical plane of incidence, an optical outgoing radiation side of an abbreviation right angle, and a reflector located in the opposite side, the reflective film 6 is formed in a reflector, and the quantity of light adjustment

pattern is formed in the optical outgoing radiation side or the reflector if needed. the optical plane of incidence of a transparent material 5 -- countering -- lines, such as a fluorescent lamp, -- the light source 7 is arranged and the line which carried out incidence from the optical plane of incidence of a light guide plate 5 -- the incident light from the light source 7 lets a light guide plate 5 pass, it reflects in the reflective film 6, and outgoing radiation of the part is carried out from an optical outgoing radiation side, and it is uniformly irradiated to the rear-face side of the liquid crystal display element 2 In addition, as a backlighting means 3, not only the thing of the structure shown in drawing 2 but the various tooth-back irradiation meanses usually used can be used.

[Translation done.]